Do Vertical ID Laws Curb Teen Drinking and Smoking? A Reconsideration

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Alcohol Misuse is Costly

- 140,000 Americans die annually from alcohol-related causes (CDC 2022)
  - Alcohol-related healthcare, workforce, crime, traffic accident costs > $315 billion (Sacks et al. 2015)
  - Some costs are external (i.e., traffic deaths to others, violent crime, addiction-related "internalities")

- Reducing alcohol misuse a national objective in each *Healthy People* since 1979 (CDC 2022)

- Many costs of alcohol misuse are generated by teenagers and young adults
  - Despite MLDA of 21, in 2019, 20% 16-to-18-year-olds drank and 10% binge drank (NIAAA 2021)
  - Over 650,000 alcohol-related emergency department episodes involving teenagers (Naeger 2017) and more than 4,000 teen fatal alcohol poisonings (Lipari et al. 2017)
  - 10% of teens report drinking and driving (2.4 million impaired driving episodes each month), and teens are estimated to be 17 times more likely to die in a traffic accident if BAC > 0.08
  - One teenager dies from drunk driving every 15 minutes (CDC 2012)
  - Teen drivers account for 15% of passenger deaths (Insurance Institute for Highway Safety 2022)

- In total, the social costs of teenage alcohol misuse in the U.S. are estimated to be approximately $28 billion per year (CDC 2022)

Costs of Alcohol Misuse

- Indeed, studies show that teenage drinking is linked to **diminished academic performance** (Cook and Moore 1993; Grossman et al. 1994; DeSimone 2009; Sabia 2010), **school violence** (Markowitz 2007), **crime** (Carpenter 2005a, 2007; Carpenter and Dobkin 2015), **suicidal behaviors** (Carpenter 2004; Carpenter and Dobkin 2009), **risky sexual behaviors and pregnancy** (Dee 2001; Carpenter 2005b; Markowitz et al. 2005), use of **harder substances** (Kirby and Barry 2012)
  - These outcomes often generate both external and internal costs
  - Other outcomes are often more difficult to measure (i.e., motivation, focus, hangover costs)

- Why aren't alcohol-involved social costs more prominently discussed in policy debates?
  - Social acceptance and higher prevalence of alcohol use relative to illicit drugs
  - Prohibition largely viewed as an unpopular policy disaster
  - No public appetite to raise the minimum legal drinking age (MLDA) beyond 21
  - There has been very limited support for increases in beer, wine, and spirit taxes
    - Strong lobbying efforts from alcohol industry and limited consumer support
    - From a research perspective, a bummer: only minimal state policy variation to identify treatment effects

High-profile legislation in New Mexico

2023 LEGISLATIVE SESSION

Lawmakers tackle raising the alcohol tax

By **Trip Jennings, New Mexico In Depth** | February 9, 2023

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Is alcohol shipping from Amazon in our future?

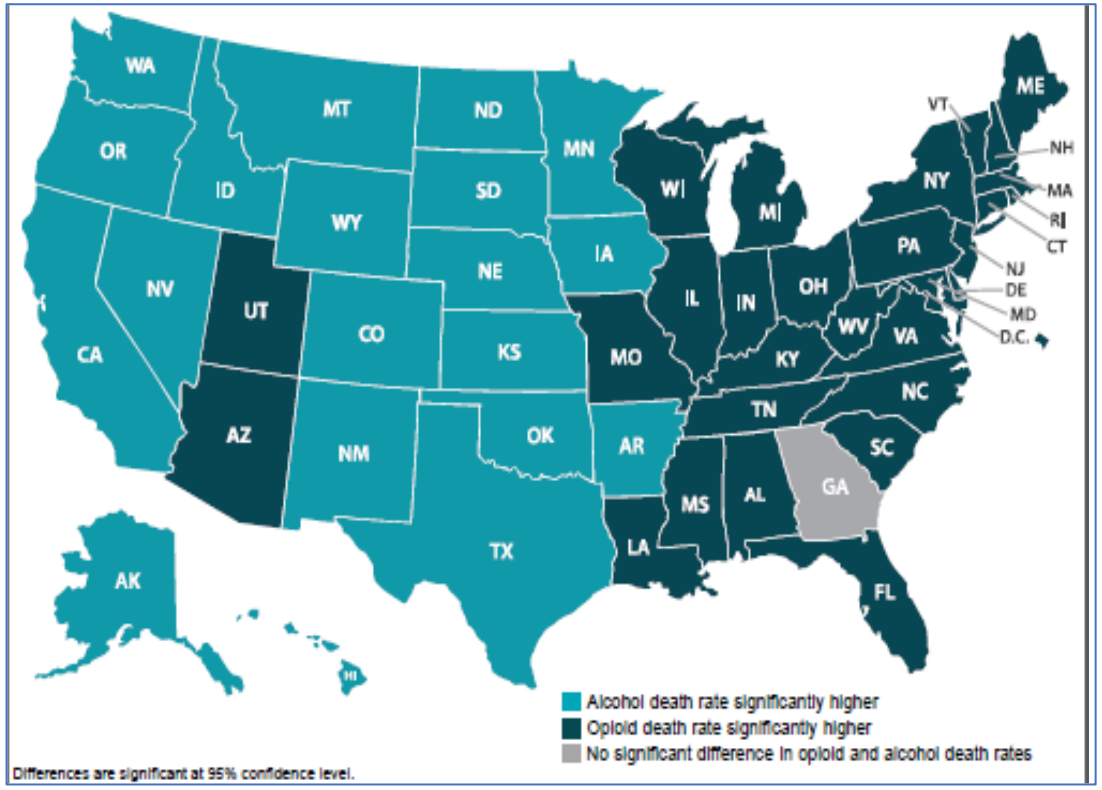
FEBRUARY 20, 2023 CBB EDITORIAL STAFF

Post-Prohibition alcohol laws, implemented to straighten out the flawed and corrupt system of the late 1800s and early 1900s, had the unintended effect of

More conversation in South Africa, South Korea, and Australia about national alcohol tax hikes.

Alcohol Deaths versus Opioid Deaths

- Alcohol-involved deaths are not infrequent
  - As recently as 2017, alcohol deaths still exceeded opioid-involved deaths
  - The rise of fentanyl has rapidly changed that in many states
  - Still, in 2019, a nontrivial share of population lived in states where alcohol death rate exceeded opioid death rate
- Linked to cardiovascular disease, cancer, immune suppression, suicide, bone marrow suppression
- Some descriptive evidence that preventing early starts to problem drinking could lead to longer-run health benefits by interrupting drinking trajectories (Kaestner and Yarnoff 2011)
  - Between 2000 and 2019, alcohol deaths increased by about 30%
  - Evidence that problem drinking during COVID-19 increased by 20%



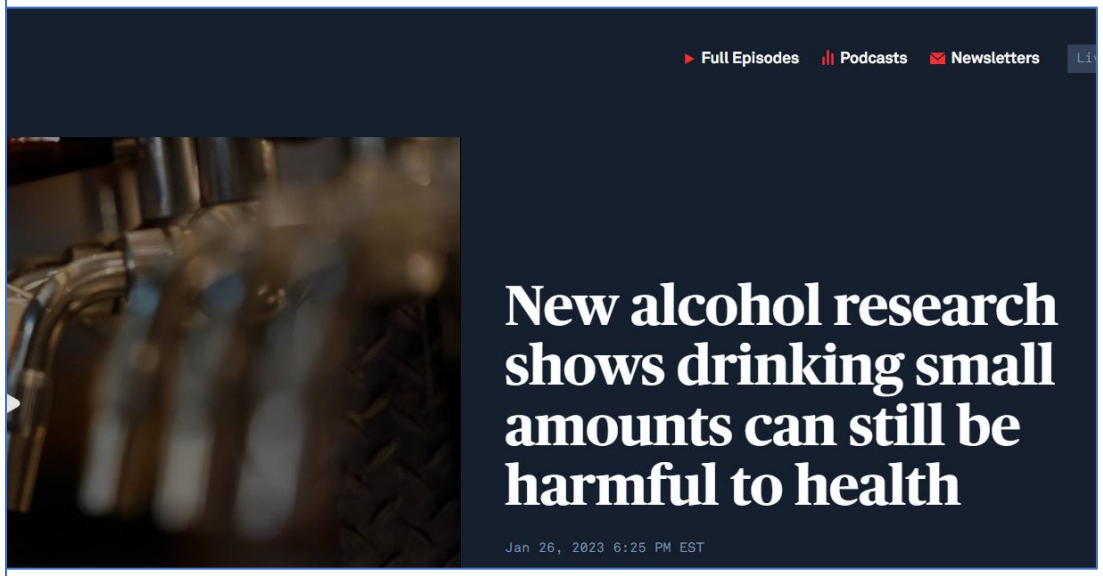
Is Alcohol Unsafe at Any Age?

The New York Times

Canada's New Guidelines for Alcohol Say 'No Amount' Is Healthy

The guidance builds on growing evidence, after decades of sometimes conflicting research, that even small amounts of alcohol can have serious health consequences.

Give this article 56



What does this mean?

- Public policies that affect alcohol misuse (*especially* among teens and young adults) — even a little bit! — are likely to generate important social benefits or costs worthy of study

- While there is strong evidence that the MLDA and zero tolerance drunk driving laws strongly affect drinking behaviors (Carpenter and Dobkin 2011), much more mixed empirical evidence on the impacts of other alcohol policies
  - Keg registration laws
  - Social host laws
  - Scanner ID laws

Youth Tobacco Use is Prolific, Persistent, and Policy Relevant

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Primary Care > Smoking & Tobacco

E-Cigs in Early Adolescence Tied to Heavier Smoking Later On

— Teens who used e-cigarettes early were more likely to become frequent smokers

by Elizabeth Short, Staff Writer, MedPage Today April 18, 2023

REUTERS®

Litigation | Government Health Policy | Public Health

U.S. Supreme Court snuffs company challenge to Los Angeles flavored-tobacco ban

By Brendan Pierson

February 27, 2023 7:09 AM PST · Updated 3 months ago

The U.S. Supreme Court building is seen in Washington, U.S., June 26, 2022. REUTERS/Elizabeth Frantz

More than 3 million middle and high school students reported using tobacco in 2022

By Raenu Charles, CNN

Updated 2:49 PM EST, Mon November 14, 2022

Cigs down, e-cigs up

E-Cigarettes May Represent a Renewed Threat

- Youth cigarette use has declined in recent years (CDC 2022)
  - However, there is some evidence that the policy response to booming e-cigarette popularity* may have had led e-cigarette users to substitute towards traditional cigarettes**
    - E-cigarette MLPA of 21, increased e-cigarette taxes
    - * Creamer et al. 2020, Cullen et al. 2019, Centers for Disease Control and Prevention 2020
    - ** Pesko et al. 2021, Courtemanche et al. 2020, Friedman 2015

Youth Cigarette Use is Also Very Costly

- 480,000 Americans die annually from combustible tobacco-related causes (CDC 2021)
- Tobacco-related illnesses cost the US $240B (2019$) in direct public health costs annually (Xu et al. 2021)
- Teen cigarette smoking is highly correlated with continued adult use (CDC 2020; Everett et al. 1999) and 1 in 3 high schoolers reported current use of some tobacco product (Creamer et al. 2020)
- Recent evidence suggests that stricter youth tobacco control policies can substantially reduce the probability of adult use (Friedson & Rees 2020) more authors?
- **So, thoughtful policy regarding underage combustible product use is important….**
- ~~welfare increases from successful youth tobacco control policies may be large~~

Vertical ID Laws (VILs)

- Mandate that minors' (below 21 years) state ID cards (drivers' licenses) be vertically oriented
  - Have now been adopted in all 50 states + DC

- Goals:
  1) Facilitate ease of age verification for age restricted substance purchase

  2) Reduce supply of **passable** "false" ID cards that minors may obtain from their peers

https://california-dmv-practice-test.org/ca-drivers-license-looks-like/

Mechanisms: How might VILs affect underage drinking and smoking?

- VILs may reduce youth alcohol/cigarette consumption through 2 possible mechanisms:

1) Lower probability that a minor can purchase age-restricted products by [confidently] presenting their own, *real* ID to a clerk who misreads it

2) Lower probability that a minor can get away with using someone else's (21+) ID to buy alcohol/tobacco

Mechanisms: Examples of VILs in Action

- Mechanism (1) – Passing off own ID as of-age
  - Minor A in a *non-VIL state successfully* purchases cigarettes using their own, horizontally-oriented ID card, because the seller miscalculates their age
  - Minor B in a *VIL state fails* a similar purchase because their vertically-oriented ID card prompts the seller to take a closer look
- Mechanism (2) – Passing off another's ID as your own
  - Minor C in a *non-VIL state successfully purchases* beer using the real, unexpired horizontally-oriented ID card of some 21-year-old peer
  - Minor D in a *VIL state fails* a similar purchase using a 21-year-old peer's unexpired, vertically-oriented ID card because the ID's orientation prompts the seller to take a closer look

Why VIL-induced Reductions May be Small

1) If minors are not frequently using their own IDs to buy, preventing these purchases will not significantly affect consumption

2) VILs will be most effective if they represent a sharp cutoff between minors and of-age consumers
   - Sharp: ID cards issued to minors expire at age 21, and sales to vertical ID holders are banned

Why VIL-induced Reductions May be Small

- Statistics do not suggest that these types of purchases are common
  - Own-purchase does not specify the type of ID used to purchase
  - So, these means represent upper bounds for the sales that VILs would prevent
  - Note that data on cigarette own-purchase predates national Tobacco-21 policy

Pre-treatment Means of Alcohol & Cigarette Own-Purchase	Age 16	Ages 17-18
Alcohol (2007-2019)	0.025	0.055
Cigarettes (1995-2015)	0.078	0.175

Why VIL-induced Reductions May be Small

- AZ Liquor Control Board: **to conclusion/policy?**
  - *A liquor-licensed business may not accept as the only form of identification an unexpired, vertical (under age 21) ARIZONA driver license or identification card when the owner/presenter has been age 21 for more than 30 days. This applies only to Arizona driver licenses and identification cards.*
  - effective 2016

Existing Literature on VILs

- Bellou and Bhatt (2013)
  - 1991-2009 National YRBS data, TWFE approach
  - Finds that VILs are associated with, among 16-year-olds:
    - 9% decline in alcohol consumption
    - 11% decline in [cigarette] smoking
  - Finds VILs may have reduced probability of teens buying cigarettes in a store

- Taking findings of Bellou and Bhatt (2013) at face value, VILs may have improved alcohol and tobacco related public health at relatively low cost
  - Estimated one-time cost of $1M to implement Michigan's VIL (Michigan State Senate 2003)

- Nesson & Shrestha (2021)
  - VIL enactment has no significant effect on alcohol-related traffic fatalities among 16-to-20-year-olds
    - If VILs do reduce teen drinking, we do not observe a downstream effect of reducing traffic fatalities

Contributions

- Among the first studies to explore effects of VILs on youth alcohol consumption and cigarette use

- Begin by replicating the work of BB (2013) using the 1991-2009 National YRBS

- Augment analyses using the 1991-2009 State YRBS
  - Same questions and measures, but sample sizes are six times larger on average
  - Samples are representative at the state-level as well as the national-level (important for state policy analysis where there is less measurement error in state-level trends in social behavior)

- Extend the study period to 2019 and combine the datasets to exploit more policy variation
  - Allows 16 additional states (plus DC) to contribute to identification
  - Longer post-treatment windows

- Employ new dynamic difference-in-differences estimates using not yet adopters of VILs as counterfactual (Callaway and Sant'Anna 2021)

- Analysis of intensive-use measures and mechanisms:
  - Extend measures of drinking and smoking to include [frequent] binge drinking and everyday smoking
  - Explore mechanisms using novel data on teens' sources of alcohol (and cigarettes)

Questions?

Data

- National and State Youth Risky Behavior Surveys (YRBS)
  - Primarily 16-year-olds
    - This is the group that would be directly affected, while 17–18-year-olds may have time to "adjust" their behavior
  - Repeated, cross-sectional, biennial, high school-based survey regarding teens' risky behaviors, including alcohol and tobacco use
  - National YRBS – administered by the CDC, designed to be representative of national behavior trends
  - State YRBS – same questions, generally administered by state health departments, designed to reflect individual states' trends
    - Weight the sample so that each state's sample is representative of the relevant state population, and the entire sample is representative of the relevant national population

Data

- Create an “Augmented” YRBS to maximize identifying variation
  - some states offer identifying variation solely in the state, or solely in the national
  - Consists of the State YRBS, with observations from the National YRBS added in state-waves that State YRBS data are not available
    - We also have specifications in which we fully combine the two
  - Similar approaches have been taken in other YRBS-based studies analyzing state-level policies
    - See: Hansen et al. (2017), Anderson et al. (2020), Rees et al. (2022), Pesko et al. (2021)

Dependent Variable Means (16-year-olds)

	1991-2009		
Dependent Variables	National YRBS	State YRBS	Augmented YRBS
Any Drinking	0.474	0.436	0.454
Binge Drinking	0.294	0.267	0.278
Binge Drinking | Drinking	0.632	0.614	0.617
Frequent Binge Drinking	0.130	0.115	0.122
Frequent Binge Drinking | Drinking	0.280	0.265	0. 270
Smoking Participation	0.281	0.237	0.258
Frequent Smoking	0.121	0.108	0.115
Everyday Smoking	0.089	0.080	0.087
Everyday Smoking | Smoking	0.319	0.340	0.332
N	35,488	166,556	186,154

Two-Way Fixed Effects (TWFE)

$$Y_{ist} = \beta_0 + \beta_1 VIL_{st} + \beta_2 \mathbf{X}_{ist} + \theta_s + \tau_t + \varepsilon_{ist}$$

- Y_{ist} is one of the outcomes mentioned prior for high school student *i* residing in state *s* in year *t*
- VIL_{st} is an indicator for whether state *s* has enacted a VIL by year *t*
- $\mathbf{X}_{ist}$ is a vector of controls used by Bellou and Bhatt 2013 including
  - demographics: race, sex, age
  - "baseline" state-level time-varying controls:
    - graduated driver's license programs; smoke free workplace, restaurant, and bar laws; zero tolerance laws; punishments for minors who attempt to buy tobacco; ID requirements for tobacco purchase; tobacco vending machine placement restrictions; minimum tobacco purchasing age of at least 18; real cigarette tax (2019$); real beer tax (2019$); annual unemployment rate; and median income (2019$)
- θ_s is a time-invariant state fixed effect
- τ_t is a state-invariant year (wave) fixed effect

Descriptive Tests of Identification Assumptions

- Event-Study Analyses
  - Allows for test of common pre-treatment trends in teenage drinking and smoking and exploration of dynamics in post-treatment effects

- Explore Controls for Spatial Heterogeneity
  - State-specific linear (quadratic) time trends control for the potential existence of state-level unobservables unfolding linearly (quadratically) over time

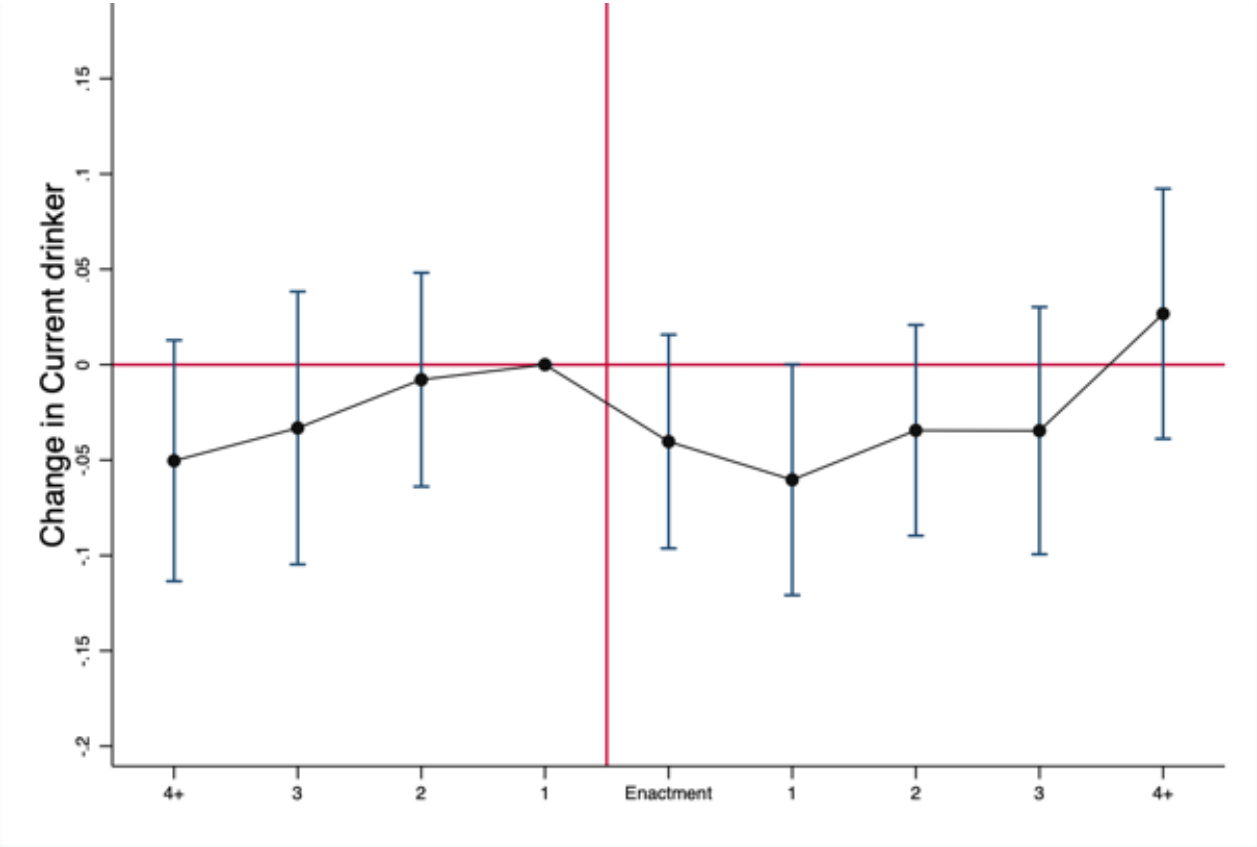
- Event-Study Analyses Using Callaway and Sant'Anna (2021) Estimates
  - Recent literature suggests TWFE estimator can produce biased estimates in the presence of heterogeneous/dynamic treatment effects
    - This occurs when "bad" comparisons of later vs. earlier adopters receive significant weight in the TWFE estimate
  - A Goodman-Bacon (2019) decomposition reveals that 47% of the weight in TWFE estimates is given to such comparisons for 1991-2019 VIL enactment data

Replication of Bellou and Bhatt (2013) National YRBS, 1991-2009

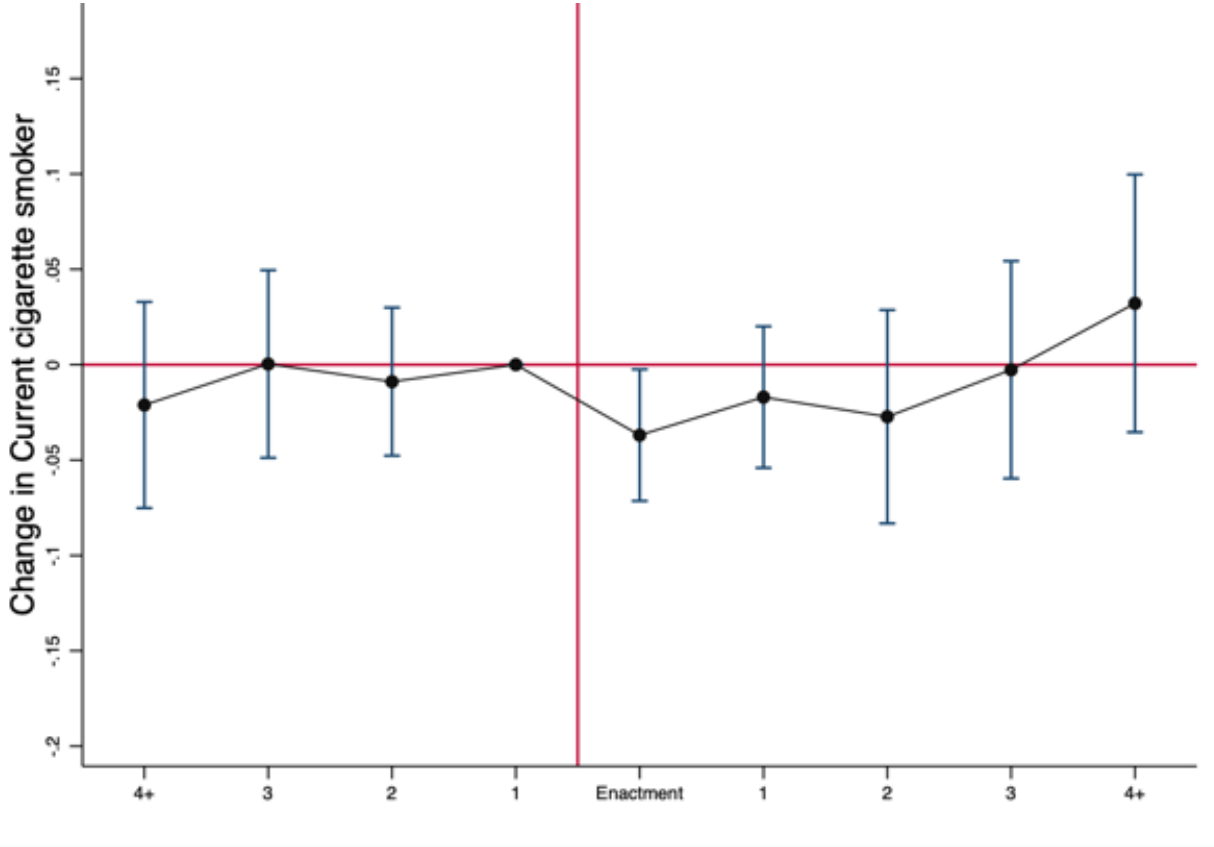
	Alcohol Use			**Cigarette Use**		
	(1)	(2)	(3)	(4)	(5)	(6)
VIL	-0.0316** (0.0152) [33,326]	-0.0349** (0.0151) [33,326]	-0.0409** (0.0184) [33,326]	-0.0202 (0.0151) [33,881]	-0.0254* (0.0139) [33,881]	-0.0306** (0.0136) [33,881]
Pre-Treatment Mean DV	0.500	0.500	0.500	0.322	0.322	0.322
State and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls		Yes	Yes		Yes	Yes
State Controls			Yes			Yes

TWFE Event Studies - National YRBS, 1991-2009

Alcohol Use



Cigarette Use

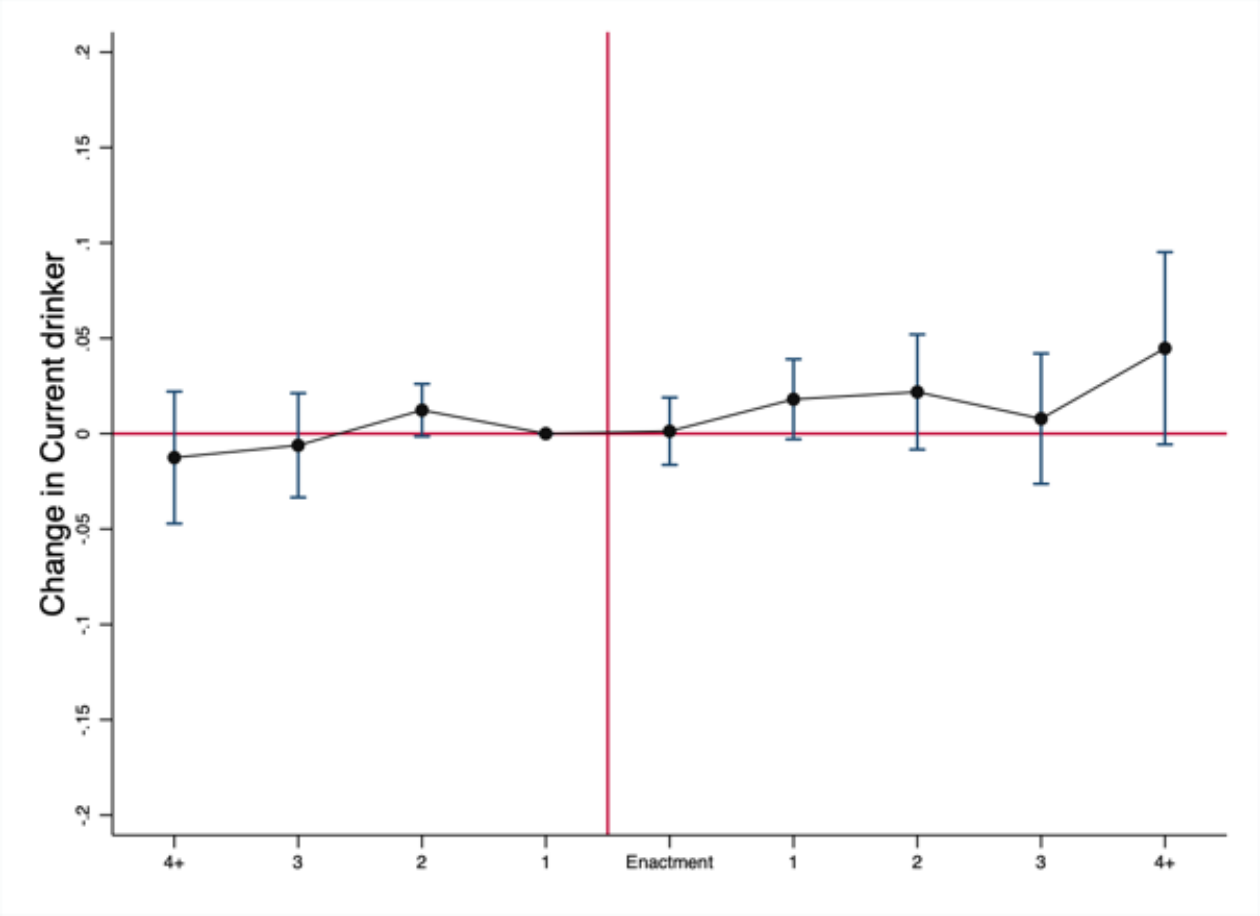


TWFE Estimates
State YRBS, 1991-2009

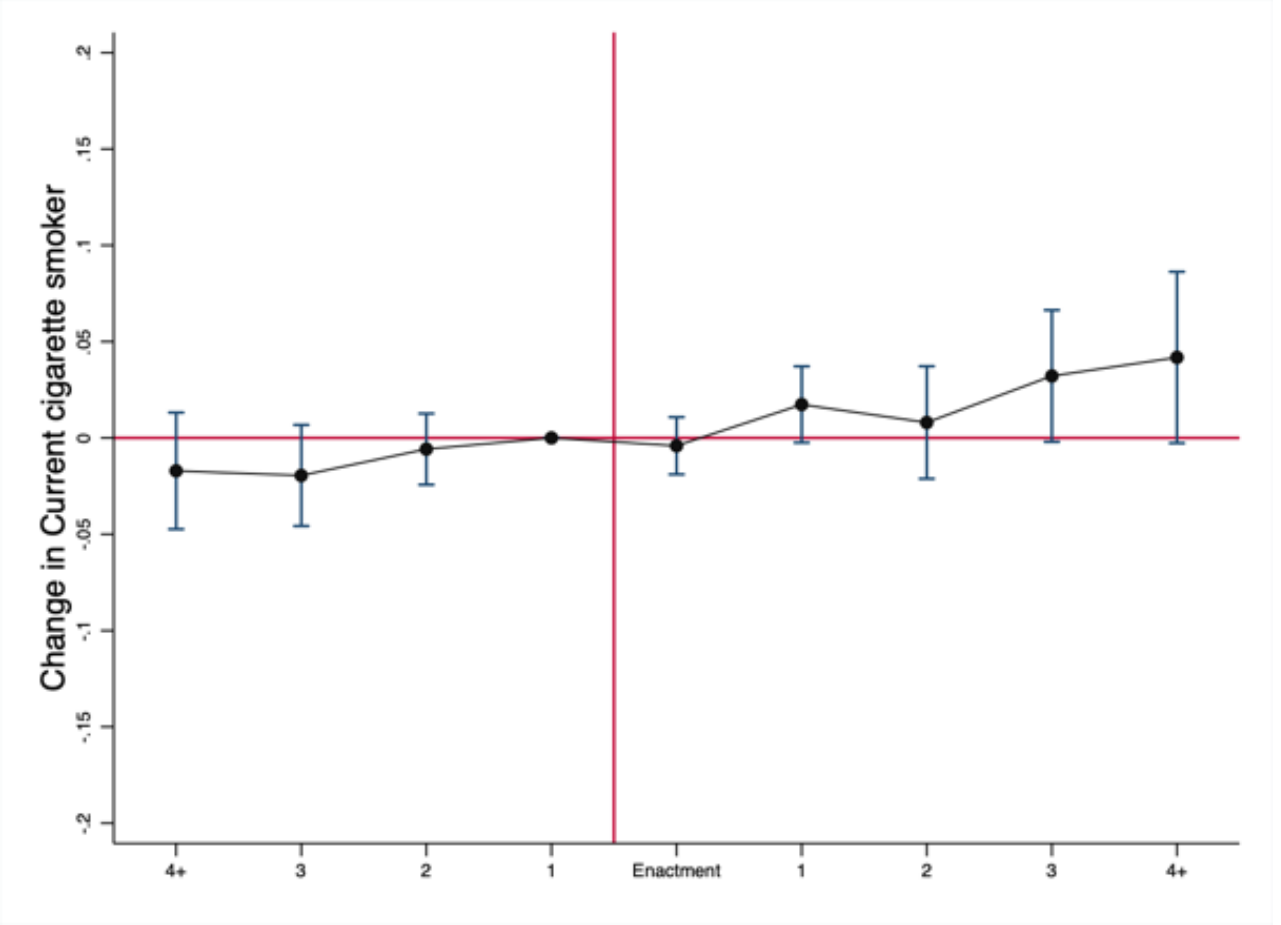
	Alcohol Use			**Cigarette Use**		
	(1)	(2)	(3)	(4)	(5)	(6)
VIL	-0.0092 (0.0076) [165,059]	-0.0102 (0.0074) [165,059]	-0.0093 (0.0090) [165,059]	-0.0004 (0.0083) [161,666]	-0.0011 (0.0086) [161,666]	-0.0044 (0.0081) [161,666]
Pre-Treatment Mean DV	0.452	0.452	0.452	0.284	0.284	0.284
State and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls		Yes	Yes		Yes	Yes
State Controls			Yes			Yes

TWFE Event Studies
State YRBS, 1991-2009

Alcohol Use

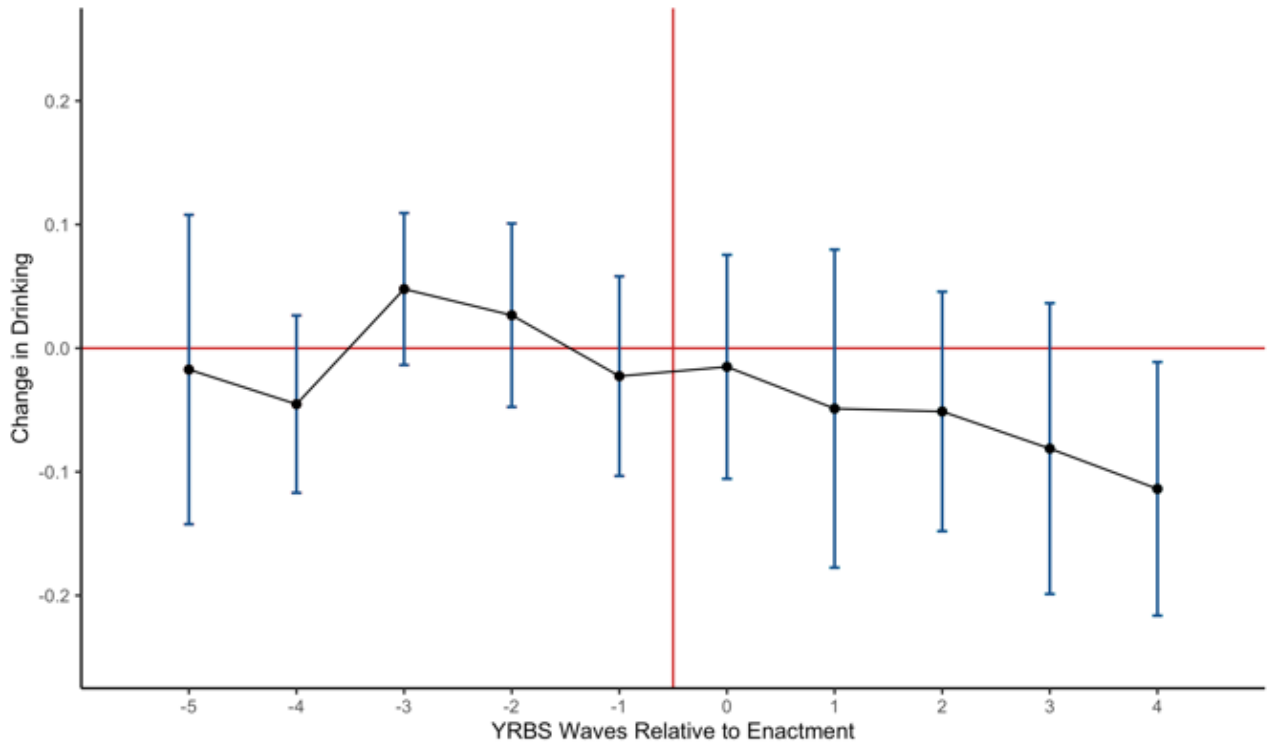


Cigarette Use

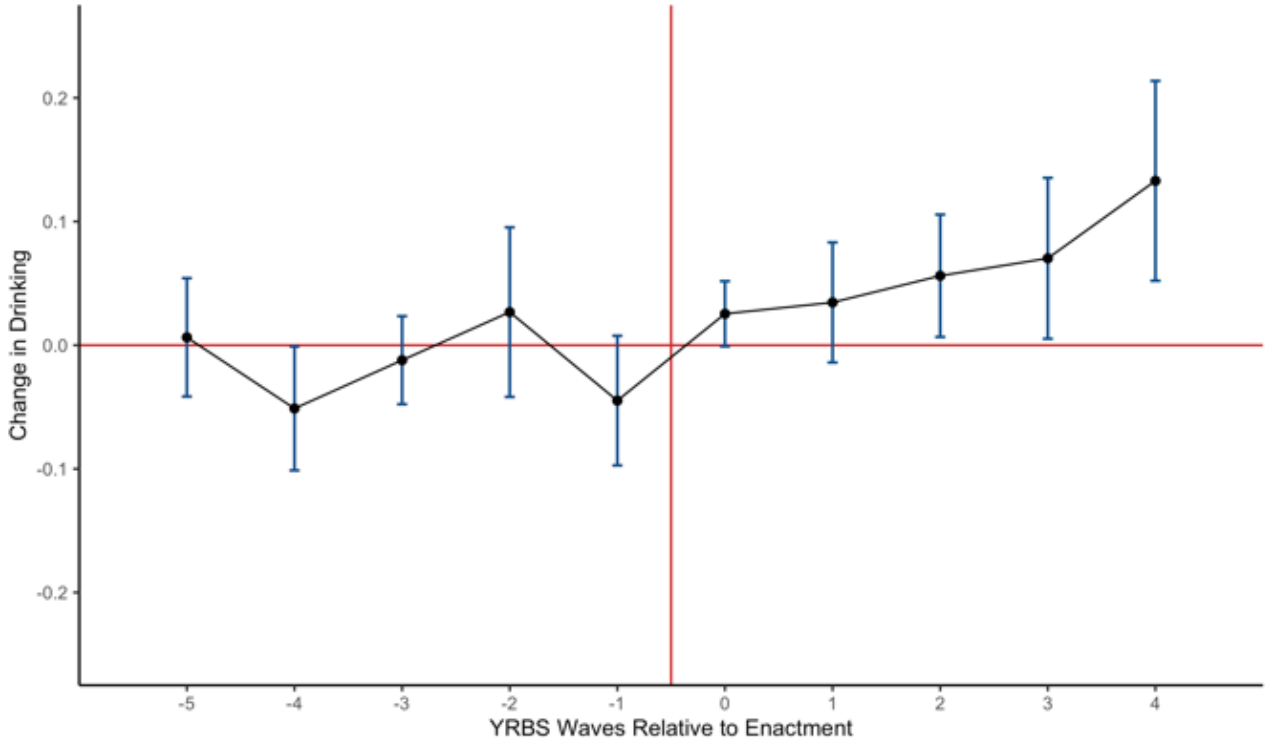


Callaway-Sant'Anna Event Studies Alcohol Use

National YRBS: 1991-2009

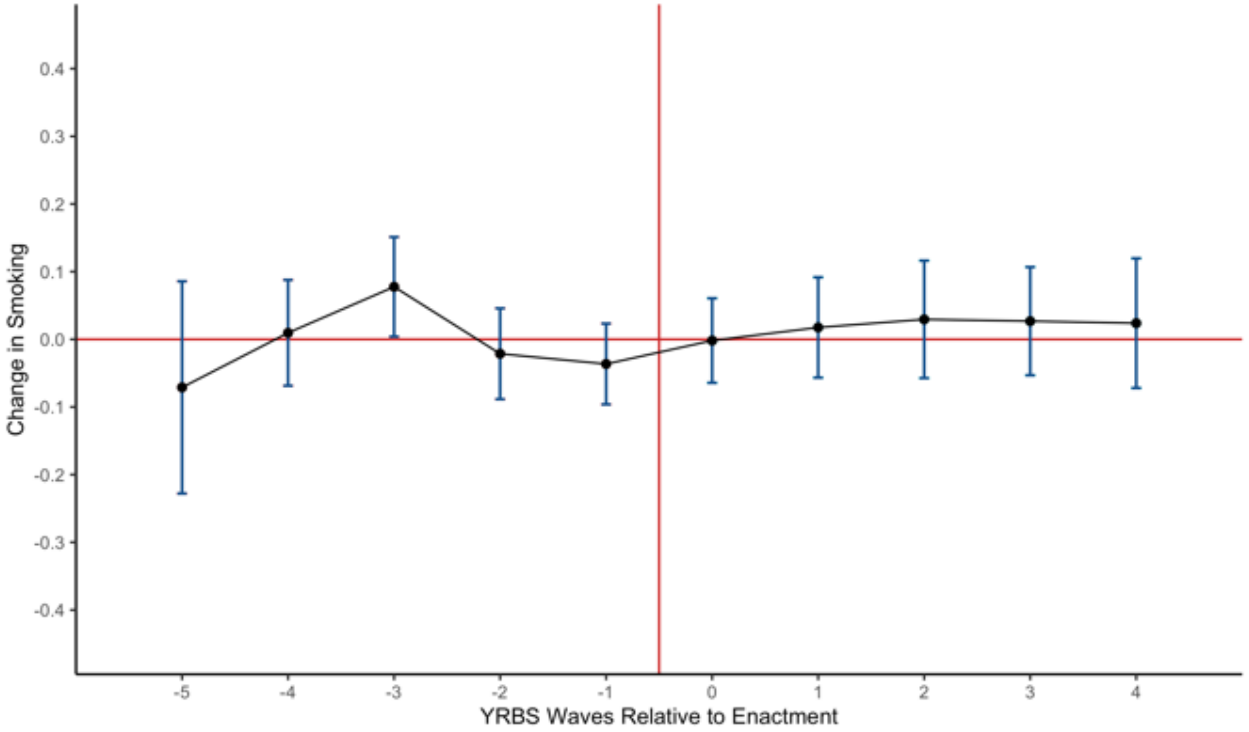


State YRBS: 1991-2009

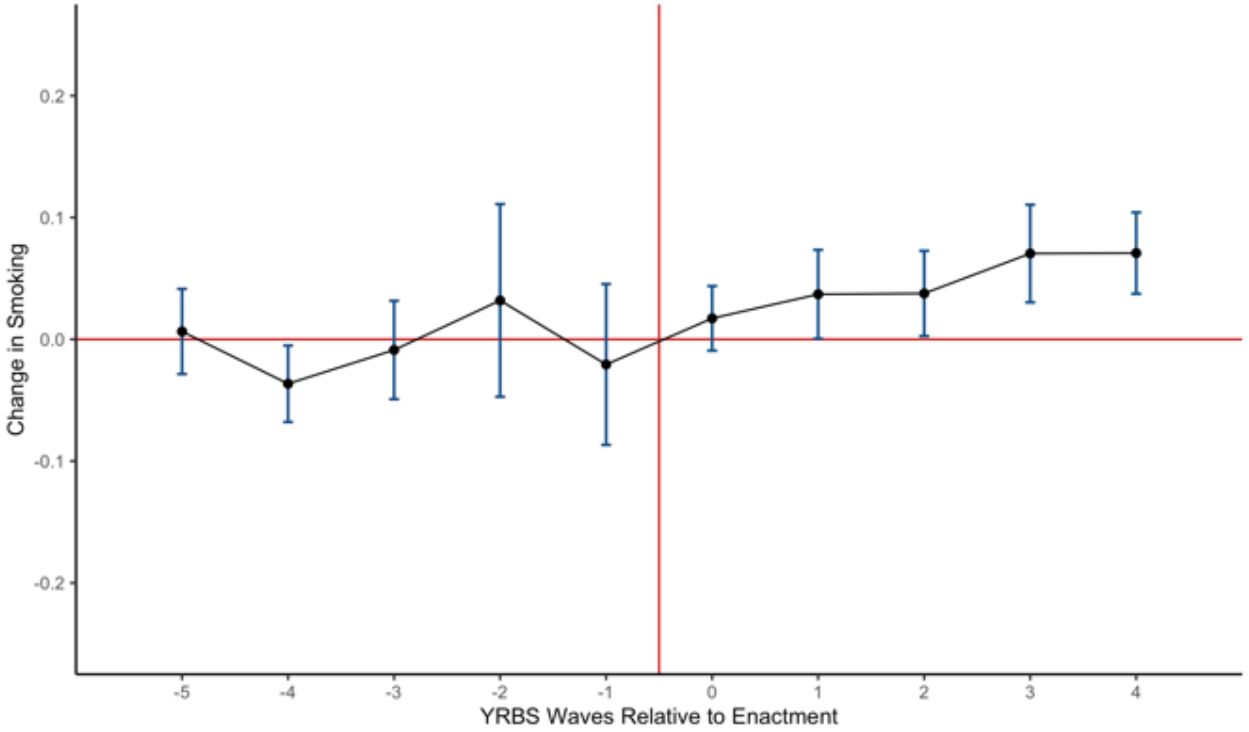


Callaway-Sant'Anna Event Studies Cigarette Use

National YRBS: 1991-2009



State YRBS: 1991-2009

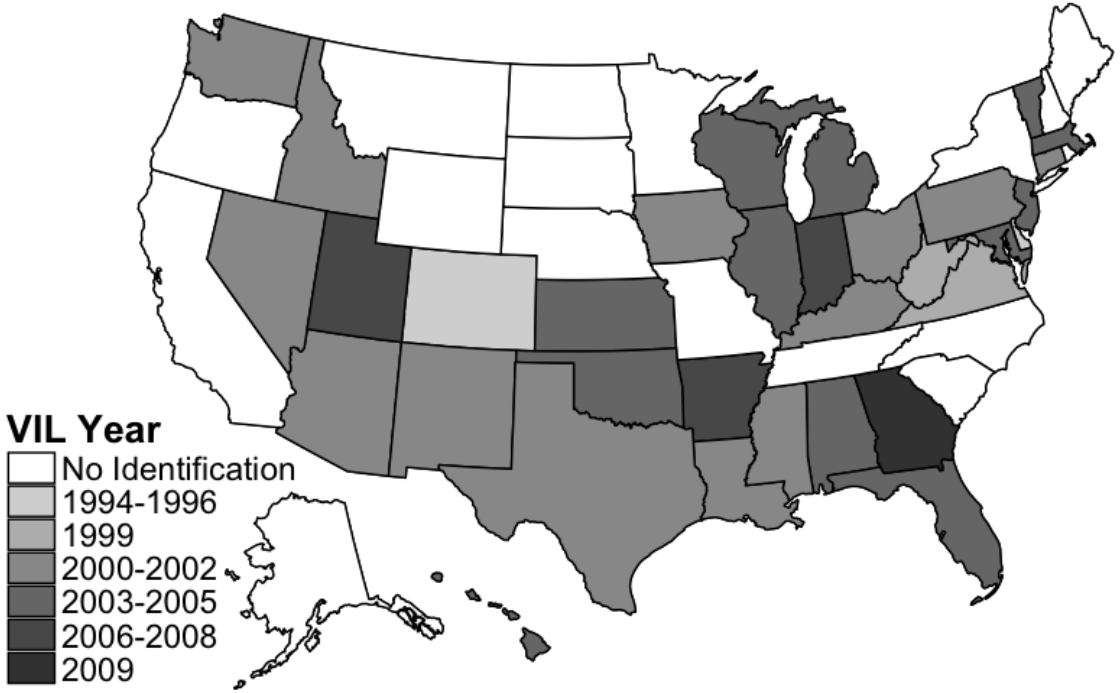


Why the Different Results?

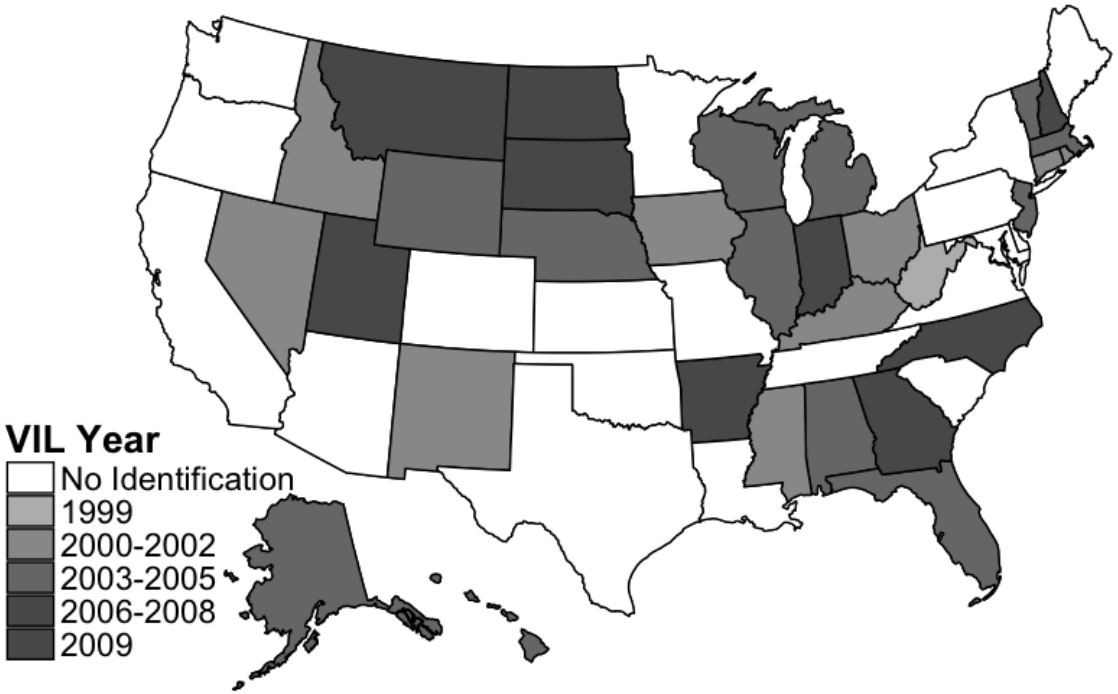
- Answer 1: Heterogeneous VIL treatment effects by state

Why the Different Results?

National YRBS: 1991-2009



State YRBS: 1991-2009



Why the Different Results?

- Answer 1: Heterogeneous VIL treatment effects by state
  - The national and state YRBS samples identify treatment effects from different states
  - We could just be documenting the way that treatment effects differ in state YRBS participants relative to national YRBS participants
  - To test: Restrict sample to states with identification in *both* samples
- Answer 2: Measurement error in the national YRBS
  - Assuming the state YRBS (designed to measure state-level trends) is more accurate

Testing for State-level Heterogeneity National & State YRBS, 1991-2009

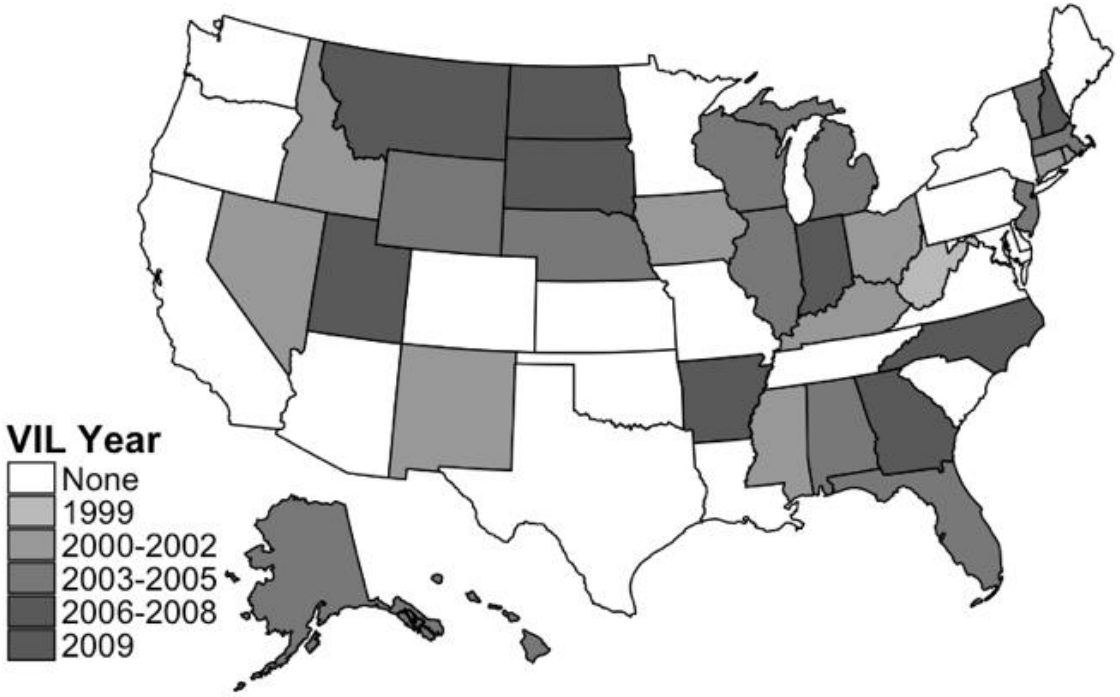
	Alcohol Use		Cigarette Use	
	(1)	(2)	(3)	(4)
		Panel I: National YRBS		
VIL	-0.0252 (0.0389) [13,845]	-0.0449 (0.0365) [12,328]	-0.0225 (0.0232) [14,143]	-0.0102 (0.0274) [12,631]
Pre-Treatment Mean DV	0.496	0.478	0.321	0.315
		Panel II: State YRBS		
VIL	-0.0097 (0.0103) [85,735]	-0.0036 (0.0091) [76,932]	-0.0124 (0.0089) [82,040]	-0.0140 (0.0089) [73,132]
Pre-Treatment Mean DV	0.452	0.461	0.286	0.287
Restrict to States that Identify Treatment Effects in National *and* State YRBS*	Yes	Yes	Yes	Yes
Restrict to State-Wave Cells with Non-Missing Data from National *and* State YRBS*		Yes		Yes

*Keeping the common set of non-adopters as counterfactuals

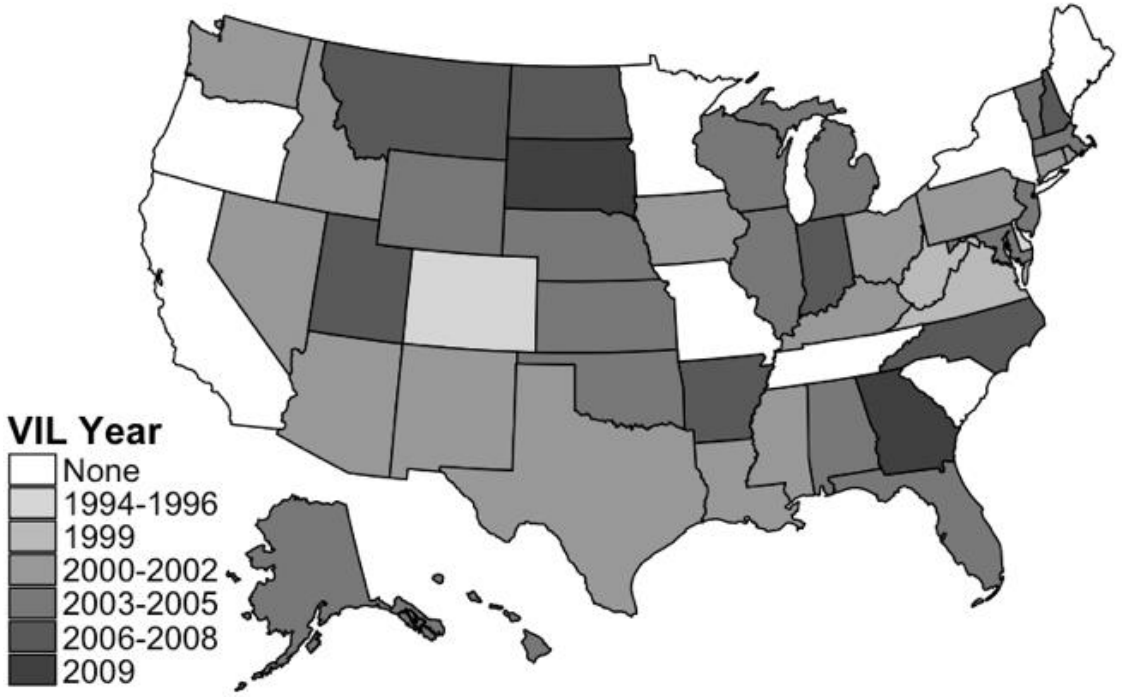
Questions?

Augmented YRBS

State YRBS: 1991-2009



Augmented YRBS: 1991-2009



TWFE Estimates
Augmented YRBS, 1991-2009

	Alcohol Use			Cigarette Use		
	NATIONAL	STATE	AUG	(4)	(5)	(6)
VIL	-0.0132 (0.0105) [182,567]	-0.0131 (0.0111) [182,567]	-0.0090 (0.0123) [182,567]	0.0099 (0.0152) [179,299]	0.0094 (0.0157) [179,299]	0.0094 (0.0164) [179,299]
Pre-Treatment Mean DV	0.476	0.476	0.476	0.308	0.308	0.308
State and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls		Yes	Yes		Yes	Yes
State Controls			Yes			Yes

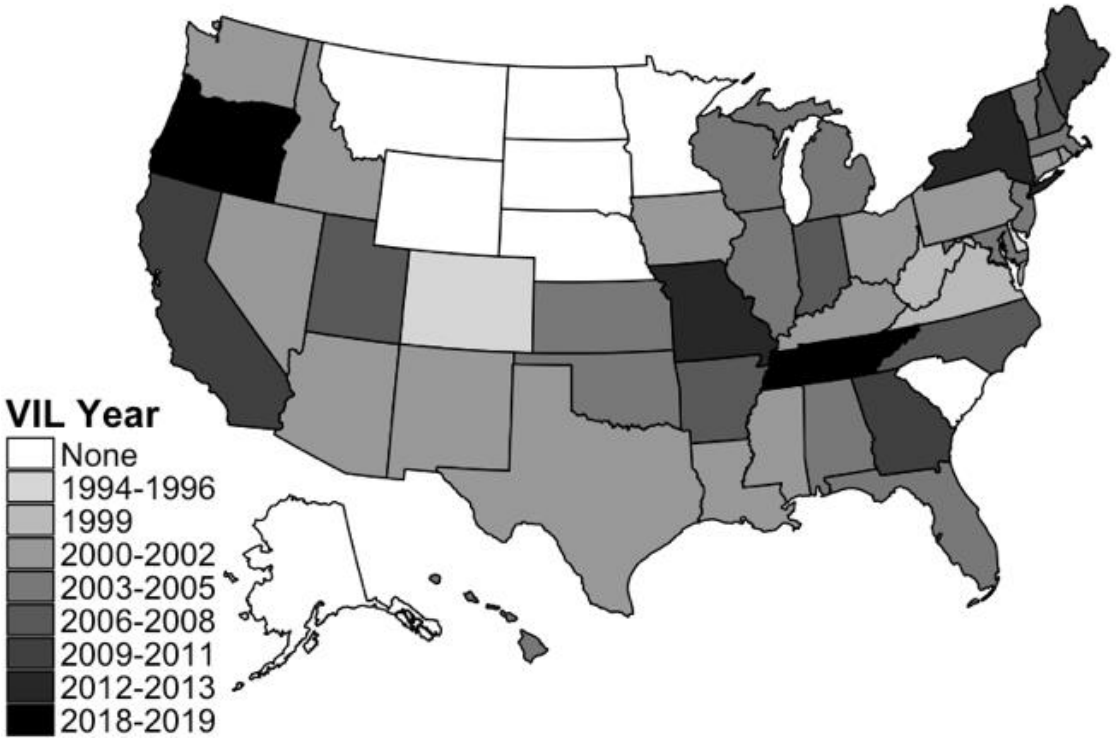
Extending the Window of Analysis

- Append additional data from each YRBS survey for 2013-2019
  - In the 1991-2019 augmented YRBS, 47 states contribute at least 3 waves (6 years) of *post* data
  - Most states contribute 4-5 waves (8-10 years) of *post* data

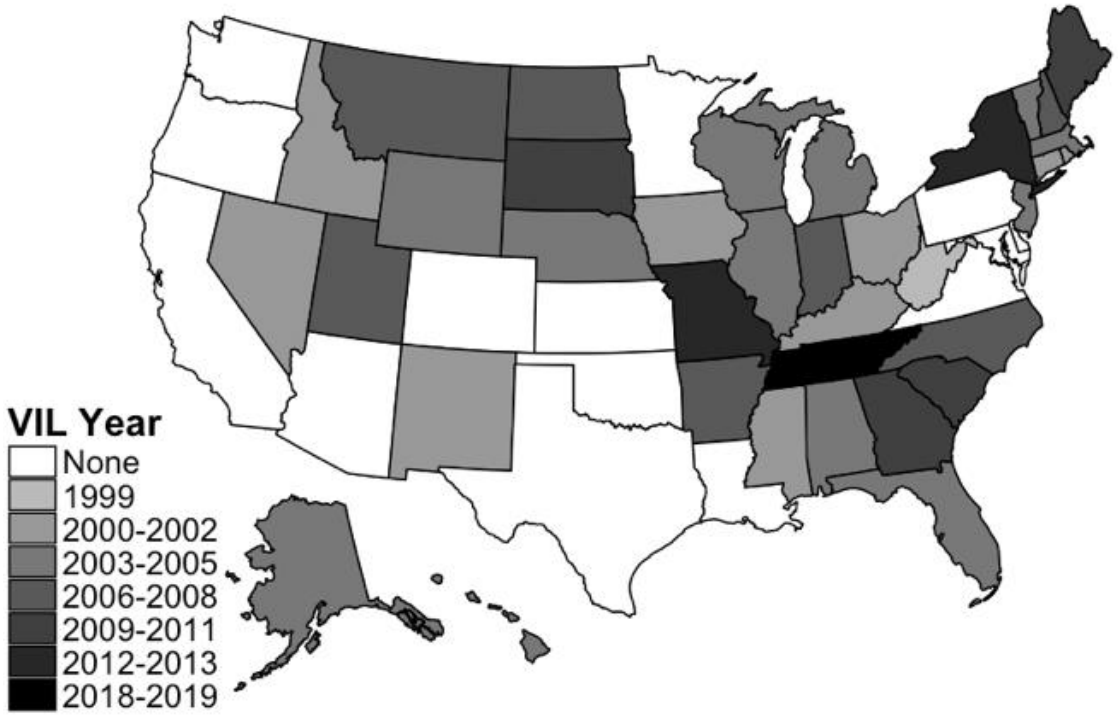
- Expand vector of state level policy covariates to include more recent policies
  - Presence of e-cigarette tax; SIDLs; keg registration policies; e-cigarette MLPA of 18; MLPA of 21 for all tobacco products

Extending the Window of Analysis

National YRBS: 1991-2019

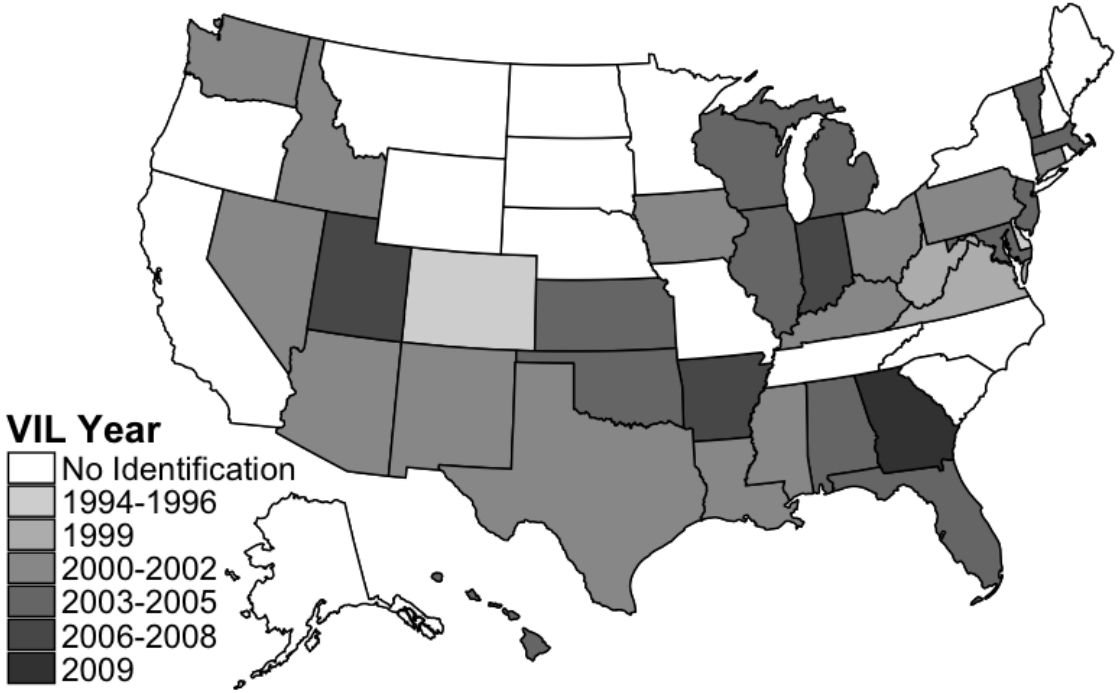


State YRBS: 1991-2019

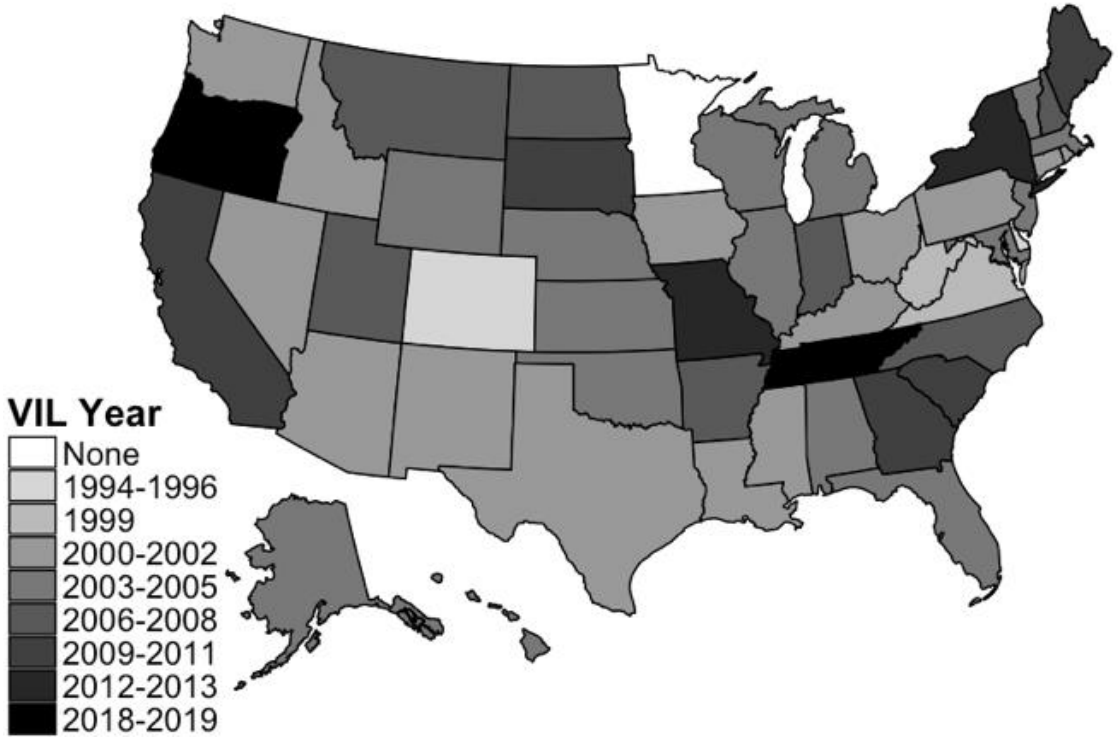


Extending the Window of Analysis

National YRBS: 1991-2009



Augmented YRBS: 1991-2019



Extending the Window of Analysis TWFE Estimates, 1991-2019

	Alcohol Use				Cigarette Use			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel I: National YRBS								
VIL	-0.0005	-0.0029	-0.0018	-0.0053	0.0004	-0.0032	0.0016	0.0014
	(0.0151)	(0.0148)	(0.0150)	(0.0141)	(0.0149)	(0.0142)	(0.0126)	(0.0113)
	[49,627]	[49,627]	[49,627]	[49,627]	[51,003]	[51,003]	[51,003]	[51,003]
Pre-Treatment Mean DV	0.478	0.478	0.478	0.478	0.294	0.294	0.294	0.294
Panel II: State YRBS								
VIL	0.0011	-0.0009	0.0006	0.0026	0.0112*	0.0098	0.0124*	0.0127*
	(0.0055)	(0.0055)	(0.0063)	(0.0065)	(0.0062)	(0.0066)	(0.0069)	(0.0066)
	[367,084]	[367,084]	[367,084]	[367,084]	[373,617]	[373,617]	[373,617]	[373,617]
Pre-Treatment Mean DV	0.443	0.443	0.443	0.443	0.262	0.262	0.262	0.262
Panel III: Augmented YRBS								
VIL	-0.0033	-0.0039	-0.0037	-0.0038	0.0154	0.0139	0.0147	0.0151
	(0.0087)	(0.0088)	(0.0097)	(0.0098)	(0.0110)	(0.0113)	(0.0112)	(0.0116)
	[387,459]	[387,459]	[387,459]	[387,459]	[394,322]	[394,322]	[394,322]	[394,322]
Pre-Treatment Mean DV	0.462	0.462	0.462	0.462	0.275	0.275	0.275	0.275
State and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls		Yes	Yes	Yes		Yes	Yes	Yes
Baseline State Controls			Yes	Yes			Yes	Yes
Expanded State Controls				Yes				Yes

Mechanism Exploration

- Marginal effects of multinomial logit estimation
  - Omitted reference group is “didn’t drink” in Panel I; “didn’t smoke” in Panel II
  - “Other” includes sources like theft, being given by others, online, etc.

	Age 16	**Ages 17-to-18**
	(1)	(2)
Panel I: Usual Sources of Alcohol (2007-2019)		
Own purchase	0.0029 (0.0038)	-0.0049 (0.0038)
Pre-Treatment Mean	0.025	0.055
Third-party	-0.0043 (0.0056)	0.0079 (0.0069)
Pre-Treatment Mean	0.093	0.125
Other	0.0173 (0.0097)	0.0095 (0.0095)
Pre-Treatment Mean	0.269	0.286
Observations	[179,792]	[228,412]
Panel II: Usual Sources of Cigarettes (1995-2015)		
Own purchase	0.0016 (0.0051)	0.0177 (0.0104)
Pre-Treatment Mean	0.078	0.175
Third-party	0.0032 (0.0088)	0.0035 (0.0049)
Pre-Treatment Mean	0.153	0.108
Other	0.0002 (0.0038)	-0.0044** (0.0030)
Pre-Treatment Mean	0.044	0.028
Observations	[210,792]	[278,311]

Robustness/Heterogeneity Tests

- Triple difference model using untreated 17-to-18-year-olds as within-state counterfactual reveal similar pattern of results as main DD estimates
- Further, no evidence of significant negative VIL effects in:
  - alternative intensive measures (binge drinking, everyday smoking, conditional on drinking/smoking, etc.)
  - specifications including state-specific linear/quadratic time trends
  - specific age-race groups
  - lagged effects for 17-to-18-year-olds who were treated at age 16
  - fully-combined national and state YRBS
  - underage traffic fatalities (FARS data)

Takeaways

- Contrary to prior research, we find little-to-no evidence that VILs were effective in reducing underage alcohol/cigarette consumption
  - Further, we find no evidence that VILs impacted the channels through which teens obtain alcohol

- It is unlikely that VILs created a significant welfare gain, but they are a common-sense policy that can continue without much objection
  - But we shouldn't expect policies like VILs that operate through a very narrow set of mechanisms to be particularly groundbreaking

- Econometrically, this is an interesting and worthwhile exercise in how different surveys can [mis]measure the gradual adoption of policies

Further Research/Policy Notes

- Look into the differential effectiveness of VILs depending on whether underage-issued ID cards expire at age 21

- Create a “sharp cutoff” between underage individuals with vertical IDs and of-age individuals with horizontal IDs